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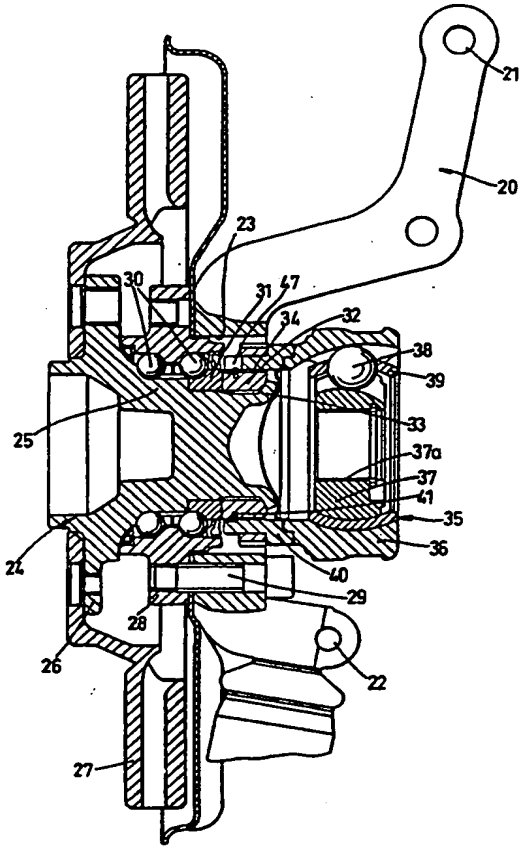
(54) Title: SECURING MEMBERS TOGETHER BY SPRING RINGS

(57) Abstract

A spring ring (41) of rectangular cross section has adjacent its ends arms which extend generally radially outwardly. The ring (41) is used to hold together two members (31, 40) in telescopic engagement by engaging in an internal groove (45) in one member and in an external groove (46) in the other. During assembly of the members the ring is located entirely in one of the grooves by a holding element (51) supported wholly by the arms on the ring. After assembly the holding element is withdrawn radially outwardly through a slot (47) in the external member.



Securing Members together by Spring Rings

Technical Field

This invention relates generally to the securing together against relative axial movement of two members in telescopic relation. The members are secured together by a spring ring which is received in cooperating grooves, an internal groove in the external member and an external groove in the internal member.

Background Art

It is known to have internal and external members as above described in which a spring ring of circular cross section is mounted, for example, in the internal groove of the external member and the free end of the internal member is provided with a chamfer. As the free end is pushed into the external member the chamfer expands the ring and allows the internal member to telescope into the external member until the external groove in the internal member is aligned with the internal groove in the external member whereupon the ring contracts and engages the side walls of both grooves to hold the members against relative axial movement.

In this arrangement the relative dimensions of the grooves and the ring are critical since when the ring is open it must pass over the internal member but when it contracts and is in its closed state it must engage the walls of both of the aligned grooves to hold the members against relative axial movement.

In some applications where greater security is required than is given by a ring of circular cross section, a ring of rectangular section is used, the section normally having a greater dimension radially than axially. When using such a ring it tends to fall to the bottom of the internal groove in the external member and a chamfer on the internal member will not lift the ring nor open the ring when the members are telescoped together. Normally, therefore, such rings have apertured ears at or adjacent their ends and are opened by normal circlip pliers to allow assembly of the members. After assembly the ears are released when the grooves are aligned. In such an arrangement the external groove will have a slot in its base through which the ears will project so

assembly and/or the method of assembly of the members. In these circumstances, none of the known arrangements described above would be suitable for assisting in the assembly of the members.

In such circumstances, therefore, it is necessary to find some means of holding the spring ring open or closed while assembling the members in telescopic relation and then allowing the ring to be released to contract or expand to its normal form when the internal and external grooves are aligned so that the ring engages the walls of both grooves to hold the members in the desired axial position.

Disclosure of Invention

It is an object of one aspect of the invention to provide a method of securing together, by means of a spring ring, two members in telescopic relation which may be used in confined situations where the prior art is not usable.

According to this aspect of the invention we provide a method of securing together, by means of a spring ring, an external member in telescopic relation with an internal member, wherein the external member has a bore, an internal groove in the bore and a slot extending radially of the bore between an inner end open to the bore and an outer end at the external surface of the member, the slot extending axially between said groove and an end of the member, and wherein the spring ring is engaged in said groove to locate the internal member and has, adjacent to its ends, arms which extend generally radially outwardly into said slot; characterised in that the internal member has an external groove and in that the method comprises mounting the spring ring in one of said grooves, releasably holding the ring in a contracted or expanded state so that it lies substantially within said one groove by engaging the ring arms with a holding element which is supported wholly by the ring, telescoping the members together while the arms are engaged with the holding element until the grooves in the members are mutually aligned and so that the ring arms and holding element are located in said slot and withdrawing the holding element radially through the outer open end of the slot thus disengaging said arms from the holding element and releasing the ring so that the ring expands or contracts to engage in both of the mutually aligned grooves to secure the members together.

velocity joint in which the two members are connected together by the method according to the invention;

Figure 2 is an elevation of the spring ring used in the assembly of Figure 1;

Figure 3 is a perspective view of a holding element with its internal shape shown dotted and which is used in the assembly of the members shown in Figure 1;

Figure 4 is a cut-away perspective view of part of the assembly shown in Figure 1;

Figure 5 is an enlarged view of part of Figure 4 illustrating the holding element and both ends of the spring ring;

Figure 6 is a detail cross-section showing the spring ring in position in the assembly;

Figure 7 is an elevation of a modified form of spring ring with a holding element holding the ring closed;

Figure 8 is a detail of Figure 7 but showing the holding element holding the ring open;

Figures 9 and 10 are detail views of alternative formations of the arms on the ring of Figure 7;

Figure 11 is a perspective view of the holding element shown in Figure 7 and 8;

Figure 12 is a plan view of the holding element of Figure 11;

Figure 13 is a plan view of a slightly different form of holding element;

Figure 14 is an elevation of a further modified form of spring ring usable in the invention;

Figure 15 is an elevation of the ring of Figure 14 showing a tool to bring its ends together;

approach one another. As shown in Figure 6 the ring 41 substantially fills the internal groove 46 and projects into the external groove 45.

It will be seen that the ring 40 is provided with a slot 47. This slot extends between the bore 48 of the ring 40 and its outer end 49 is at the external surface of the ring. The slot also extends inwardly and has an inner wall 50, the outer end of the slot being open to the outer end of the ring 40.

During assembly of the members, the ring is held in a contracted state by means of a holding element 51 shown in detail in Figure 3. The holding element may, for example, be moulded from plastic material or could be made of metal. The holding element is made of a solid block and has a central aperture 52. This aperture has a width w which is just greater than that of the arms 44 of the ring so that the arms can be engaged in the aperture; the mouth of the aperture is chamferred at 53. The holding element has a portion 54 whereby it can be gripped. This portion is narrower than the portion having the aperture 52.

To assemble the members the ring 41 is mounted in the groove 45 in the ring 32 forming part of the inner part of the wheel bearing. The arms 42 of the ring are then contracted together. The arms of the contracted ring are inserted into the aperture 52 in the holding element 51 and this holds the ring in its stressed position in which it is completely contained within the internal groove 45 in the ring 32. During insertion of the arms 42 into the holding element the outer surfaces 44 of the arms 42 engage the chamfers 53 in the holding element.

The members are then telescoped together with the splines in the rings 32 and 40 engaging one another and in an orientation such that, as the parts move together, the holding element 51 which is holding the arms of the ring 41, is received in the slot 47. When the parts are fully telescoped, the internal groove 46 in the ring 40 will be aligned with the internal groove in the ring 32 and the holding element 51 will be lodged in the slot 47. The gripping portion 54 of the holding element is then gripped and pulled radially outwardly of the slot thus releasing the arms 42 on the ring 41 as shown in Figure 5 and allowing the ring to expand to its position shown in Figures 2 and 6. In this position the ring fully fills the external groove 46 and partially fills the internal groove 45.

shown in Figure 7, the holding element can be used to hold the ring in its closed position which may be its unstressed position. This is effected by sliding the holding element into engagement with the arms 61 in the direction of the arrow C in Figure 7. The inclined portions 64 of the arms engage the surfaces 72 and as the holding element is moved inwardly in the direction of the arrow C the inner surfaces 72 move down the inclined surfaces 64 until the projections 65 at the arms are received in the depressions 73 in the holding element. The holding element is thus held releasably in position and can be removed from the ring by grasping the tab 69 and moving the holding element in the direction opposite to the arrow C.

Figure 8 shows how the holding element can be used to hold the ring in its expanded position e.g. in its stressed state. In this position the projections 71 on the arms of the holding element are received in the depressions 63 in the internal surfaces of the arms 61 and thus hold the ring in its expanded position to allow assembly of two telescopic members.

The ring 60 and the holding element 66 may be used in assembling the members described in relation to Figures 1, 4 and 5. Thus the ring may be inserted in the internal groove 46 in the ring 40 forming part of the outer race of the constant velocity joint with the arms 61 received in the slot 47. The holding element 66 may then be inserted between the arms as shown in Figure 8 to hold the ring in an expanded, stressed condition so that it is wholly within the internal groove 46. The parts may then be telescoped as described above until the grooves 45 and 46 are in alignment whereupon the holding element 66 can be withdrawn through the slot 47 which will result in the ring returning to its unstressed state as shown in Figure 7 in which it will engage both grooves 45 and 46.

The holding element can then be re-inserted into the slot 47 so that it assumes the position shown in Figure 7 and holds the ring in its unstressed state in engagement with both grooves. This prevents the possibility of the ring expanding under centrifugal force in use to disengage itself from the groove 45.

During an assembly operation, therefore, once the ring 60 has been installed and the holding element 66 replaced as shown in Figure 7, inspection of the assembly will show that the ring is properly installed.

having a base 91 and arms 92. The arms slope inwardly and have convex formations 93 which engage in the concave formations 84 in the arms. The holding element 90 may be made of resilient material so that it can be easily slid over the ends of the arms 83 so that the convex formations 93 are received in the concave formations 84.

The ring is used to hold together two telescopic members of the form, for example, as shown in Figures 4 and 5. In use, the ring 80 is placed in the groove 45 in the ring 32 and if necessary is sprung open to be received in the groove. When the ring is in the groove, the notches 85 are engaged by the jaws 86 of the tool T and the ends of the ring are brought together. The holding member 90 is then slipped over the ends of the ring to hold it in a contracted position. In this position the ring is wholly received in the slot 45. As described above the parts are moved so that the grooves 45 and 46 are in alignment and then the holding element 90 is removed through the slot 47 from the arms 83 which allows the ring 80 to move to its unstressed state in which it fills the groove 46 while also being partly received in the groove 45. To facilitate removal of the holding element the latter may have an aperture 92 formed in the base thereof which may be engaged with a hook or similar tool.

Figure 17 shows a modified holding element. In this figure the holding element comprises a U-shaped part 93 having arms 94 which can engage the arms 83 on the ring 80 in a manner similar to that shown in Figure 3 and also a projecting portion 95 which, as shown, can be inserted into the gap 82 between the arms 83 when the ring is in its unstressed state. The projecting portion 95 may have projections 96 at its ends which are received in notches in the inwardly-facing surfaces 97 of the arms thus to retain the holding element in the position shown in Figure 17.

In using the modified holding element, the insertion of the ring into the groove 45 in the ring 40 and the assembly of the members would be as before. Once the holding element had been removed and the ring had moved to its unstressed state to engage in both grooves 45 and 46, the holding element would be turned round and the projection 95 inserted through the slot 47 into the gap 82 to hold the ring in its unstressed state thus substantially filling the groove 46. The holding element would be releasably held in position by the projections 96 as described.

It will be seen that the invention provides a means and method for assembling two members to

Claims

1. A method of securing together, by means of a spring ring, an external member in telescopic relation with an internal member, wherein the external member has a bore, an internal groove in the bore and a slot extending radially of the bore between an inner end open to the bore and an outer end at the external surface of the member, the slot extending axially between said groove and an end of the member, and wherein the spring ring is engaged in said groove to locate the internal member and has, adjacent to its ends, arms which extend generally radially outwardly into said slot; characterised in that the internal member has an external groove and in that the method comprises mounting the spring ring in one of said grooves, releasably holding the ring in a contracted or expanded state so that it lies substantially within said one groove by engaging the ring arms with a holding element which is supported wholly by the ring, telescoping the members together while the arms are engaged with the holding element until the grooves in the members are mutually aligned and so that the ring arms and holding element will be located in said slot and withdrawing the holding element radially through the outer open end of the slot thus disengaging said arms from the holding element and releasing the ring so that the ring expands or contracts to engage in both of the mutually aligned grooves to secure the members together.

2 A method according to Claim 1 characterised in that after the ring has expanded or contracted to engage in both of said grooves the holding element is inserted into the slot and engaged with the arms to hold the ring in its expanded or contracted state in which it is engaged in both of said grooves.

3. A method according to Claim 1 or Claim 2 characterised in that the ring is held in its contracted state during assembly and then allowed to expand to hold the members together and so that the ring substantially fills the internal grove in the external member and projects into the external groove in the internal member.

4. A method according to Claim 3 characterised in that the ring has formations in its outer periphery adjacent to the arms for engagement by a tool and in that the ring is contracted

in which the ring is in either a closed state or open state respectively; characterised in that (1) the holding element has oppositely-facing surfaces which engage generally-radial, oppositely-facing surfaces on the edges of the arms to hold the ring in its stressed state, (2) in that said surfaces on the arms and the holding element can be disengaged by radially outward movement of the holding element relative to the arms and (3) in that the holding element has a part remote from said surfaces whereby it may be gripped.

11. The combination of a spring ring of rectangular cross section, the ring having a normally open state of rest in which it has spaced apart ends adjacent to which are arms which extend generally radially outwardly and a holding element dimensioned to engage said arms releasably to hold the ring in a closed state, characterised in that (1) the holding element has inwardly-facing surfaces which engage generally-radial, outwardly-facing surfaces on the edges of the arms to hold the ring in its closed state, (2) in that said surfaces on the arms and the holding element can be disengaged by radially outward movement of the holding element relative to the arms and (3) in that the holding element has a part remote from said surfaces whereby it may be gripped.

12 The combination according to Claim 11 characterised in that the holding element is of U-shape in cross section, the inner surfaces of the limbs of the U providing said inwardly facing surfaces.

13 The combination according to Claim 12 characterised in that the holding element is of hollow rectangular shape in cross-section and is dimensioned to receive the arms of the ring within the rectangle.

14. The combination according to any of Claims 11 to 13, characterised in that in that the part of the holding element whereby it may be gripped can be inserted between the ring arms to hold the ring in its open state.

15. The combination according to any of Claims10 to 14, wherein the holding element and the arms have releasable inter-engaging projections and recesses which engage when the ring arms are engaged with the holding element.

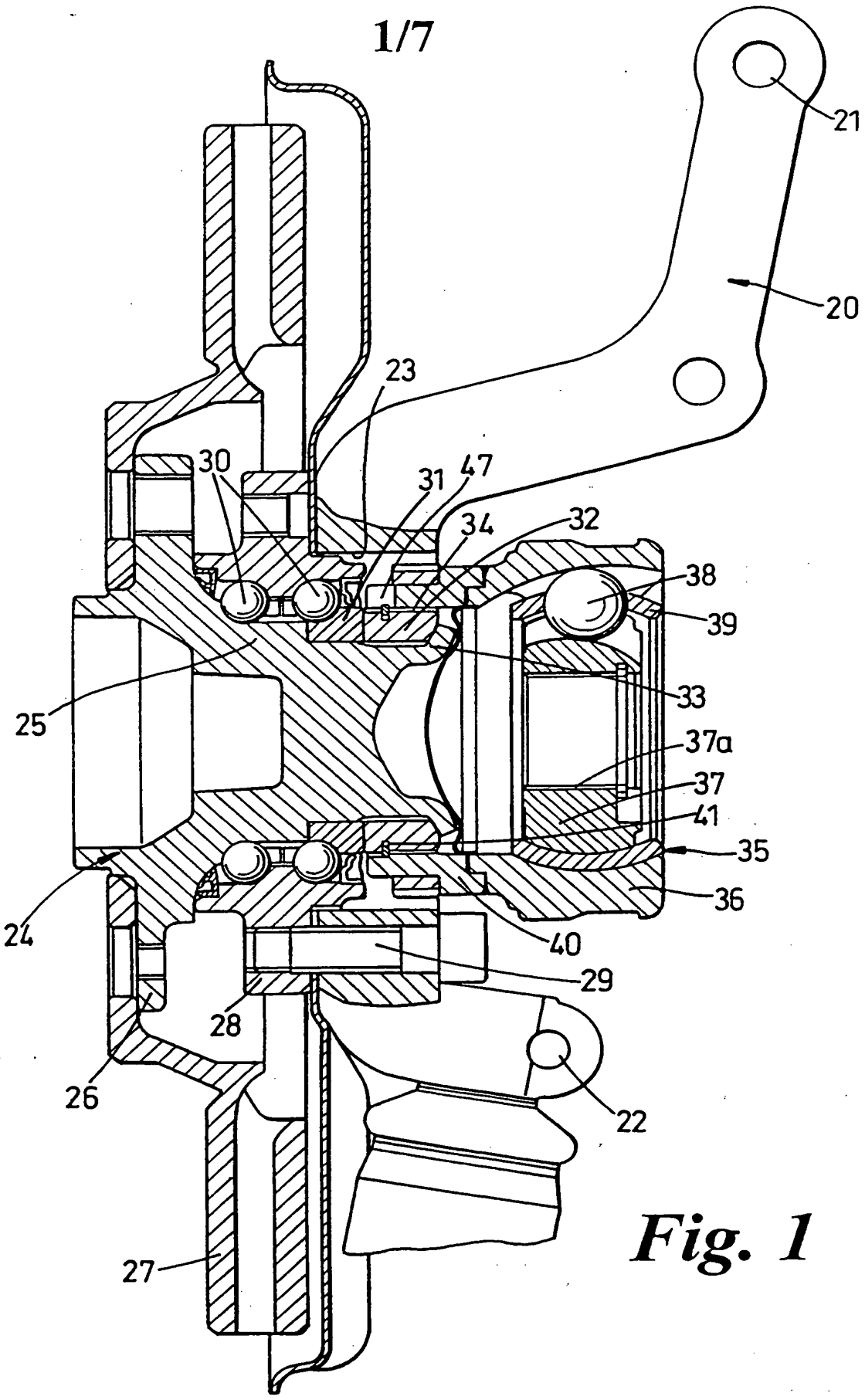


Fig. 1

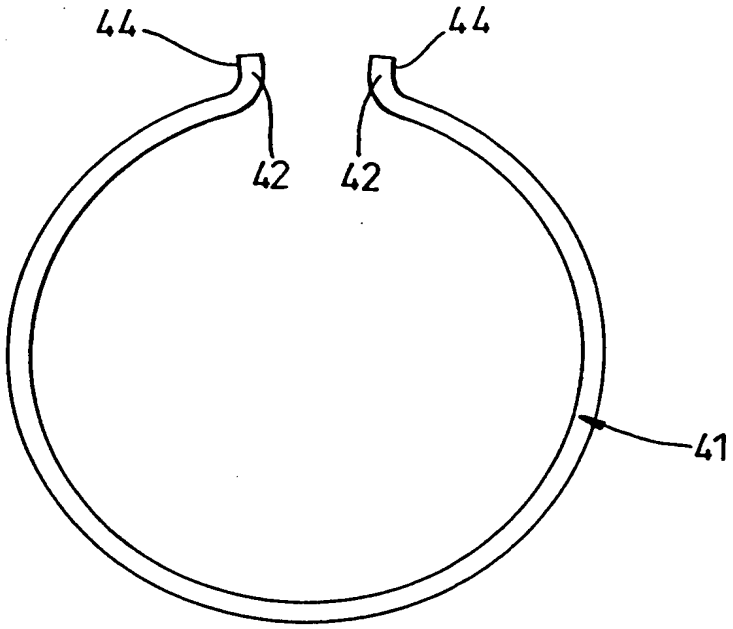


Fig. 2

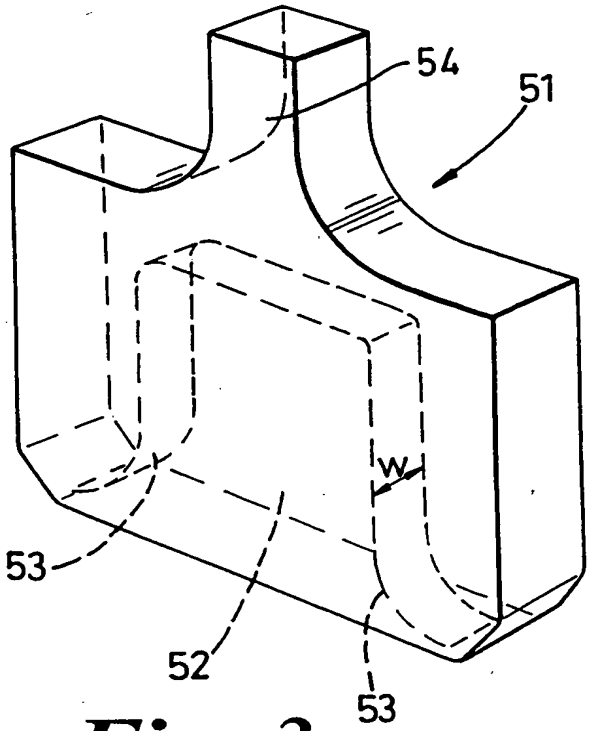


Fig. 3

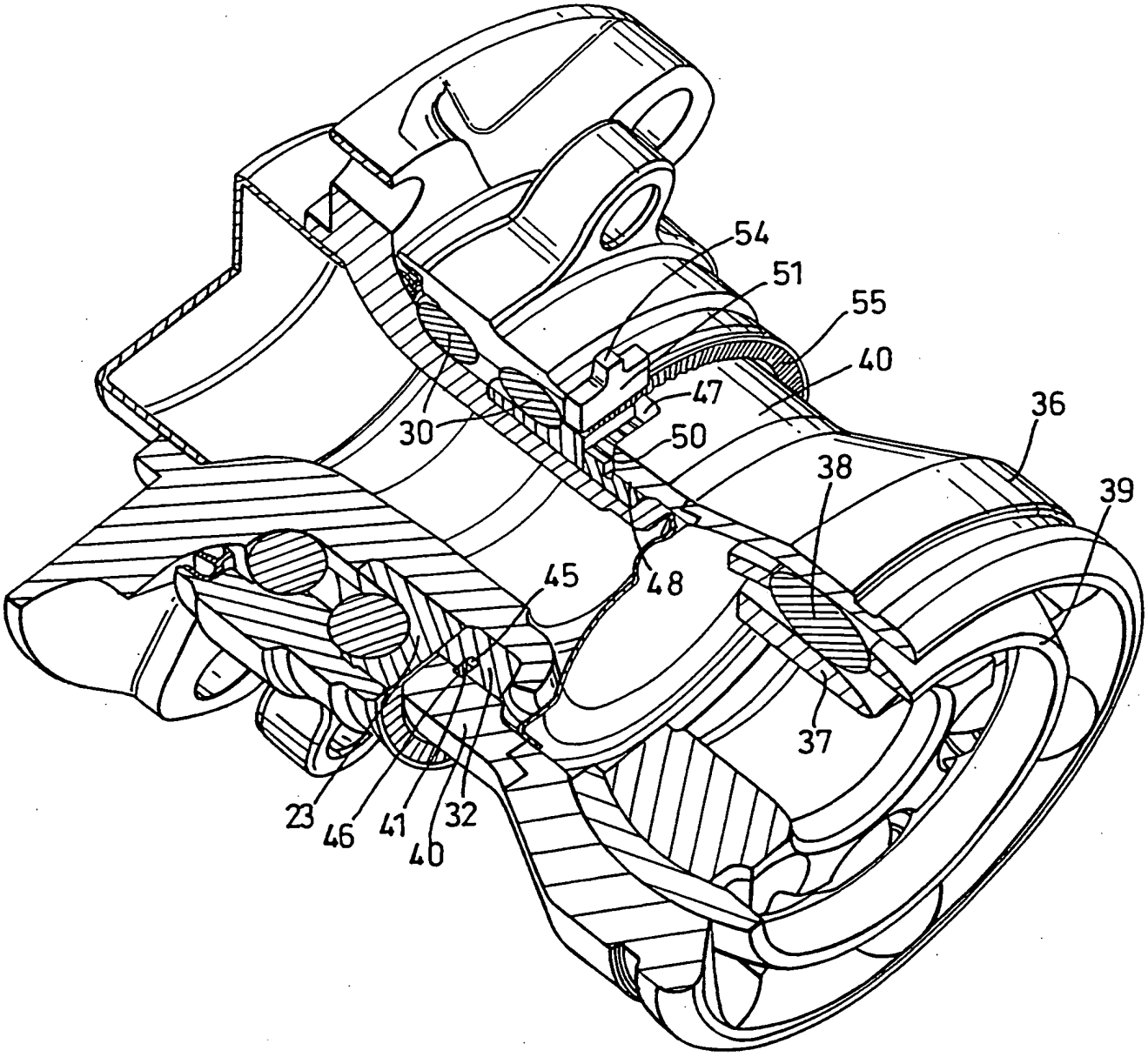


Fig. 4

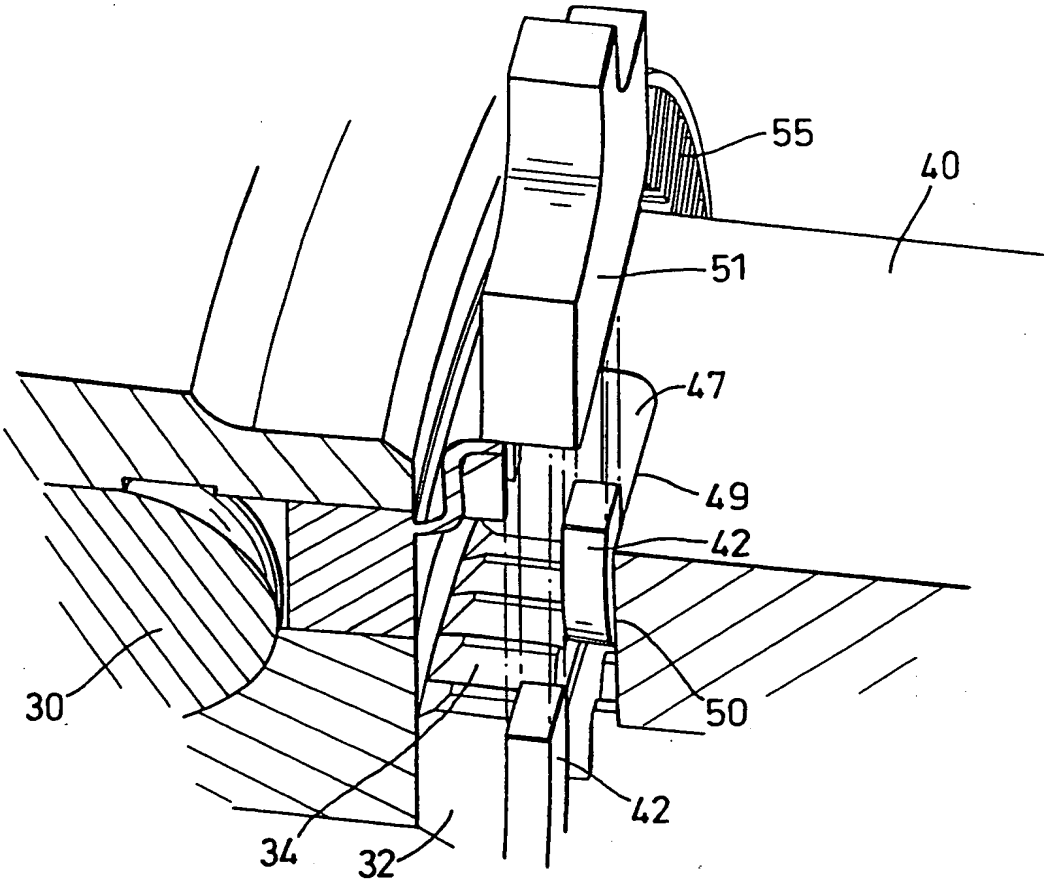


Fig. 5

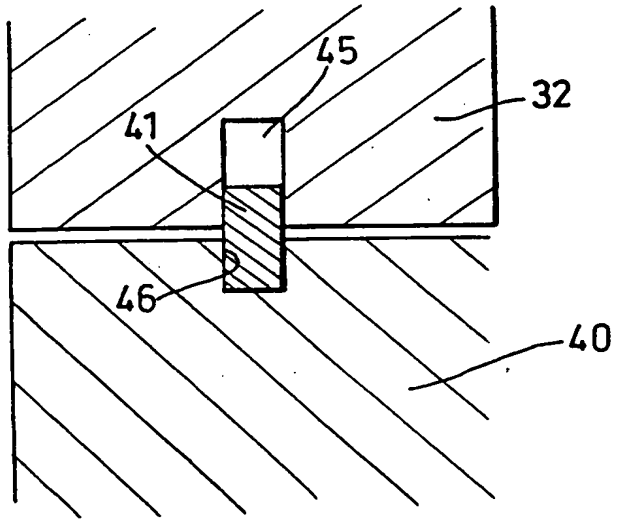


Fig. 6

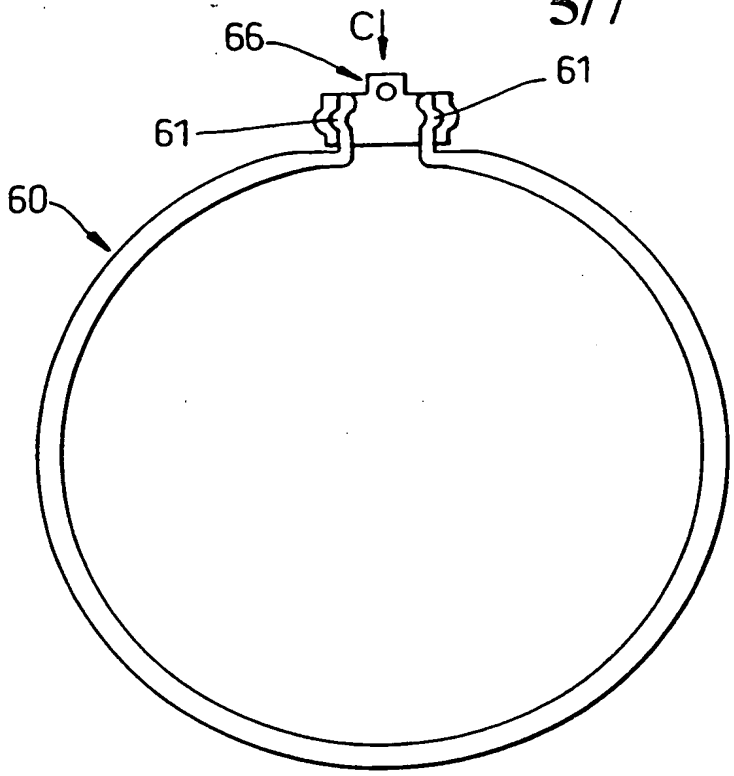


Fig. 7

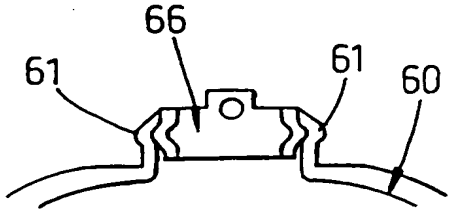


Fig. 8

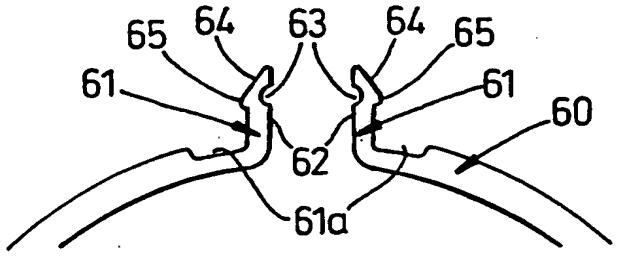


Fig. 9

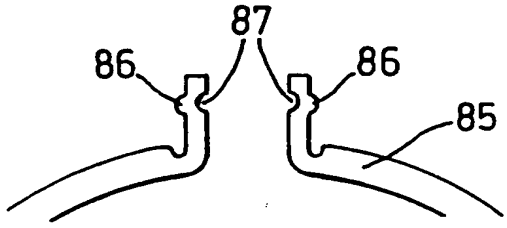


Fig. 10

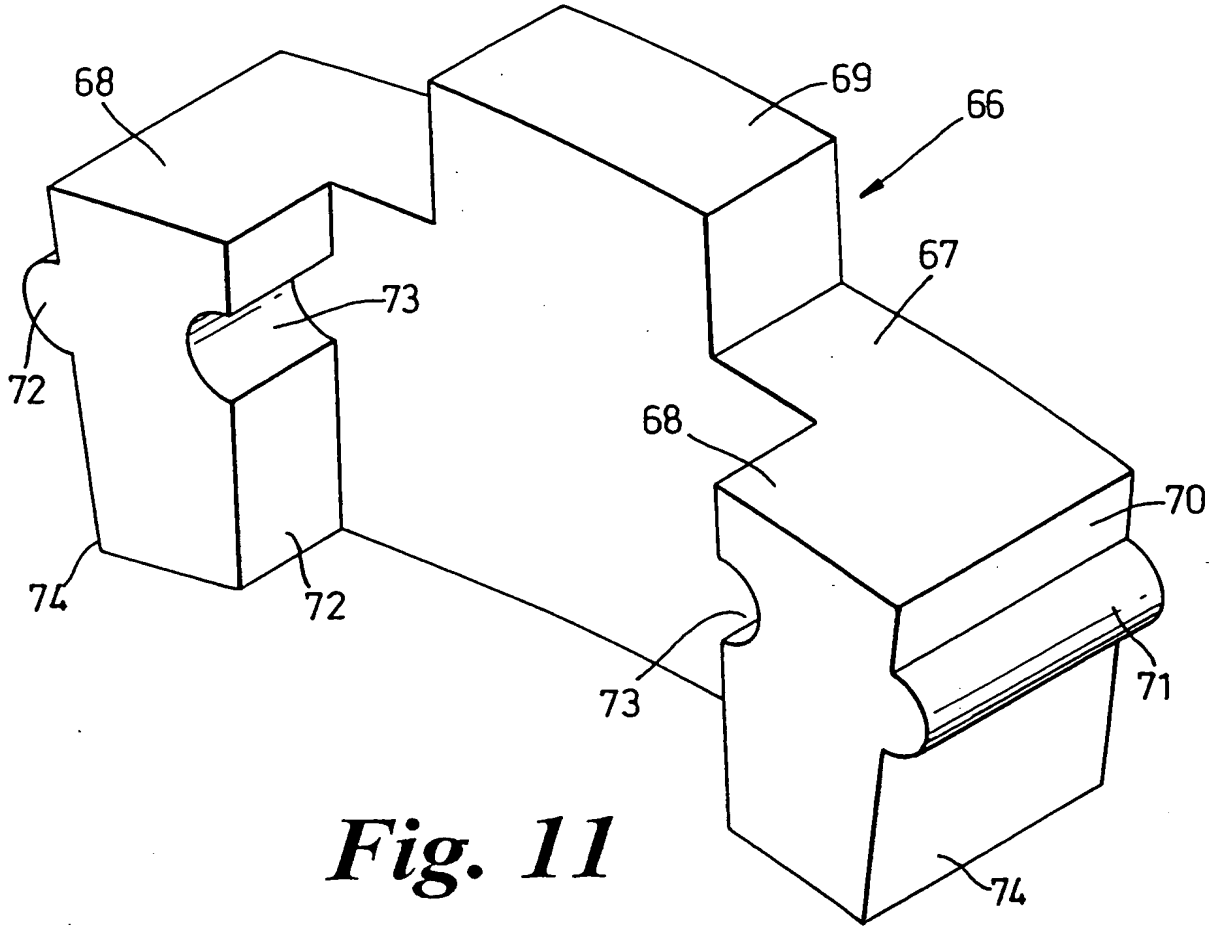


Fig. 11

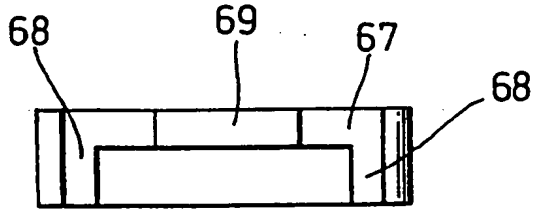


Fig. 12

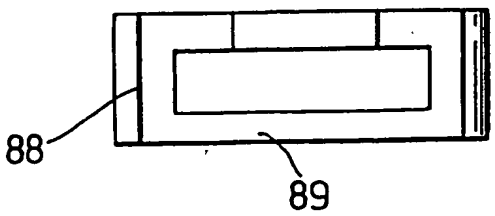


Fig. 13

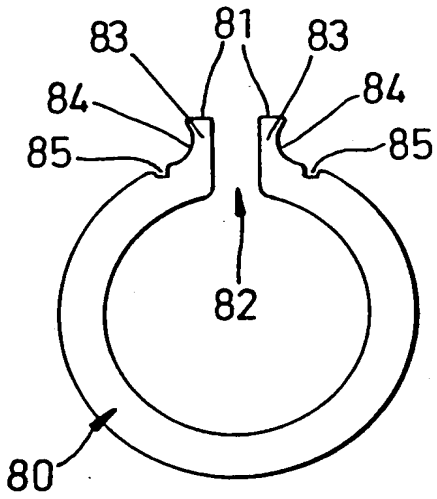


Fig. 14

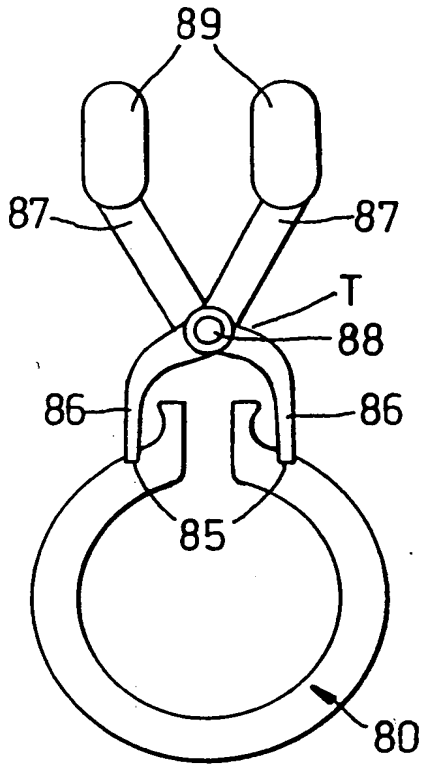


Fig. 15

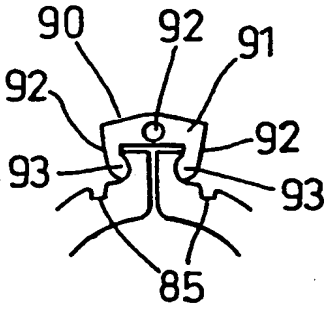


Fig. 16

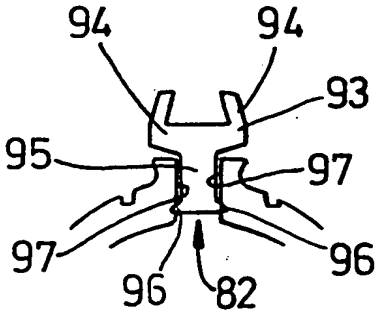


Fig. 17

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 98/02681

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 F16B21/18 F16C35/063 B60B27/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 F16B F16C B60B F16D B25B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	FR 2 349 057 A (JOHNSON METALL AB) 18 November 1977 cited in the application	1,3-9
A	see page 2, line 15 - page 3, line 31; figures 1-8	10-12,16
Y	GB 1 223 050 A (IMPERIAL CHEMICAL INDUSTRIES LIMITED) 17 February 1971	1,3-9
A	see page 3, line 51 - line 54; figures 1-9	10,11
Y	DE 197 00 313 A (GKN AUTOMOTIVE AG) 31 July 1997 see column 5, line 7 - line 13; figures 1-6	8,9
A	US 3 701 303 A (KONDO ISAMU) 31 October 1972 see abstract; figures 1-8B	1,4,5, 10,11,16
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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
10 December 1998	17/12/1998

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	CALAMIDA, G

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Ir. . ational Application No
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